# **Statement of Basis**

# Title V Air Quality Permit Renewal

Northern Lights Ethanol, LLC (POET Biorefining – Big Stone)
Big Stone City, South Dakota

South Dakota Department of Environment and Natural Resources

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## 1.0 Background

On July 3, 2001, the South Dakota Department of Environment and Natural Resources (DENR) issued a Title V air quality operating permit to Northern Lights Ethanol, LLC (Northern Lights Ethanol) for an ethanol production facility near Big Stone City, South Dakota. The facility was permitted to produce 62 million gallons of undenatured ethanol per year and dried distiller grains and solubles (DDGS) as a saleable byproduct. After a modification in June 2002, which increased the production rate to 80 million gallons of undenatured ethanol per year, the Title V air quality operating permit was renewed on September 8, 2006.

The following revisions were made to the Title V air quality operating permit:

- 1. On April 10, 2007, DENR issued a minor permit amendment for the installation of two grain storage bins and associated equipment;
- 2. On October 30, 2007, DENR issued a minor permit amendment to revise the amount of paved roads and parking lots required to be paved;
- 3. On February 2, 2009, DENR issued a minor permit amendment to remove the sulfur dioxide testing requirements for the regenerative thermal oxidizer and correct the plant wide carbon monoxide limit; and
- 4. On March 19, 2009, DENR issued a modification to route the fluid bed cooler exhaust to the regenerative thermal oxidizer for air pollution control during normal operation and allow the regenerative thermal oxidizer to be bypassed for 100 hours per year. Several other changes were made during the modification.

On March 9, 2011, DENR received an application to renew the Title V air quality operating permit. Permit condition 4.2 states if a timely application for permit renewal is submitted six months prior to the date of expiration, then the existing permit shall not expire and the conditions of the permit shall remain in effect until the Secretary takes final action on the permit renewal application. Northern Lights Ethanol's Title V air quality operating permit expired on September 8, 2011. DENR considers the renewal application timely and Northern Lights Ethanol is allowed to operate under the Title V air quality operating permit until DENR acts on the permit renewal application.

#### 1.1 Existing Equipment

Table 1-1 provides a list of permitted equipment from the existing Title V air quality operating permit issued March 19, 2009.

Table 1-1 – Description of Permitted Units, Operations, and Processes from Existing Permit

	Tuble 1-1 - Description of 1 erminea Chils,	Maximum	Control
Unit	Description	Operating Rate	Device
#1	Grain receiving, grain transfer via enclosed conveyor belt systems, and storage bin loading. Trucks and railcars transport grain to the ethanol plant and dump grain into receiving pits located in a partially enclosed building. Elevator legs transport the grain from the receiving pit to grain storage bins. The owner or operator may construct and operate four grain storage bins during the term of this permit. The exhaust gases from the associated grain transfer system and storage bin loading process shall be routed to the baghouse associated with Unit #1.	Transfer rate equals 840 tons of grain per hour  Permanent grain storage capacity is 2,810,000 bushels	Baghouse
	Dried distiller grain and solubles load out by truck or railcar.	220 tons of dried distiller grain and solubles per hour	
#2	Grain cleaning, grain transfer, and surge bin loading. The grain is transferred from the grain storage bins to a grain cleaner. The cleaned corn is transferred to a surge bin.	140 tons of grain per hour	Baghouse
#3	Corn milling process consists of a hammer mill and elevators that transport corn from the surge bin to the hammer mill and ground corn to the fermentation process. The hammer mill shall be decommissioned once the owner or operator constructs and operates Unit #22, #23, #24, #25,-#27 and #28.	The maximum process rate for the flour conveying system may increase to 95 tons per hour.	MAC baghouse
#4	Fermentation system. Ethanol is produced	165 tons of mash per hour	Wet scrubber. The

	Maximum Control			
Unit	Description		Device	
Unit	from the fermentation process. The fermentation process consists of four fermentation tanks and the liquid beer is stored in a beer well.	Operating Rate	owner or operator shall route the exhaust gases from the wet scrubber to the seven chambered regenerative thermal oxidizer associated with Unit #6. The exhaust gases from the wet scrubber shall be routed to the seven chambered regenerative thermal oxidizer on and after the initial startup of Unit #26. The exhaust gases from the wet scrubber may bypass the seven chambered regenerative thermal oxidizer under	
#5	Distillation process. The distillation process distills the liquid beer from the fermentation process. The distillation process consists of the beer stripper, rectifier, side stripper, molecular sieve, and evaporator.	34,000 gallons of beer per hour	the terms of this permit.  Koch Industries packed bed wet scrubber. The owner or operator shall decommission this wet scrubber and route the exhaust gases to the wet scrubber associated with Unit #4 by the initial startup of Unit #26.	
#6	Dryer system – Two ICM dried distiller grain and solubles dryers, in series, fired with natural gas. The owner or operator shall modify the two existing dryers to operate in parallel and construct a third ring dryer to operate in series with the two existing dryers. The third ring dryer shall be fired with natural gas.	23 tons of dried distiller grain and solubles per hour. The maximum process rate may increase to 30 tons per hour once the third ring dryer is installed. The maximum heat input for each existing dryer is 55 million Btus per hour. The third ring dryer shall have a maximum heat input of 60 million Btus per hour.	Each existing dryer will have an ICM multicyclone to collect product and control emissions and a two chambered regenerative thermal oxidizer fired with natural gas. The thermal oxidizer has two burners rated at six million Btus per hour.	

		Maximum	Control
Unit	Description	Operating Rate	Device
#6	Five centrifuges used to separate the thin stillage and solids fractions of the wet distiller grain. The owner or operator shall install two new centrifuges.  Exhaust gases from Unit #4 and #26 shall be routed to the seven chambered regenerative thermal oxidizer and may bypass the seven chambered regenerative thermal oxidizer under the terms of this permit.	Existing centrifuges equals 25 tons of whole stillage per hour. The maximum process rate may increase to 75 tons of whole stillage per hour once the two new centrifuges are operational.	The owner or operator shall decommission the existing regenerative thermal oxidizer and install a seven chambered regenerative thermal oxidizer with a maximum heat input of 40 million Btus per hour by the initial startup of Unit #26. The seven chambered regenerative thermal oxidizer shall be fired with natural gas.
#7	Dried distiller grain and solubles cooling and transportation system. The owner or operator may decommission this process and convert it to a dried distiller grain receiver system during the term of this permit. The exhaust gases from the receiver system shall be passed through the existing baghouse.	22.8 tons per hour. The maximum process rate may increase to 30 tons per hour once the third ring dryer is installed.	MAC baghouse
#8	Dried distiller grain and solubles silo loading process.	22.8 tons per hour. The owner or operator may increase the process rate of this system to 30 tons per hour during the term of this permit.	MAC baghouse
#9	Industrial cooling tower	Not Applicable	Not Applicable
#10	Boiler #1 – Johnston steam boiler, Model #PFTS2000-#G150S, fired with natural gas and distillate oil.	81 million Btus per hour heat input.	Low NO <sub>X</sub> burner
#11	Boiler #1 – Johnston steam boiler, Model #PFTS2000-#G150S, fired with natural gas and distillate oil.	81 million Btus per hour heat input.	Low NO <sub>X</sub> burner
#15	Tank #1 – Aboveground storage tank for storing ethanol.	180,000 gallons	Internal floating roof
#16	Tank #2 – Aboveground storage tank for storing denaturant (gasoline).	60,000 gallons	Internal floating roof
#17	Tank #3 – Aboveground storage tank for storing denatured ethanol or 200-proof ethanol.	1,000,000 gallons	Internal floating roof

T124	Donasis tion	Maximum	Control
Unit	Description	Operating Rate	Device
#18	Tank #4 – An above ground storage tank	1,000,000 gallons	Internal floating roof
	for storing denatured ethanol or 200-proof ethanol.		
#19		180,000 gallons	Internal floating roof
#19	Tank #5 – An above ground storage tank	180,000 ganons	Internal floating roof
#20	for storing ethanol Submerged truck loading rack	39,000 gallons of denatured	The owner or operator
#20	Submerged truck loading fack	ethanol per hour.	shall install an air-
		emanor per nour.	assisted flare with an
			operating rate of 6.4
#21	Rail car loading rack	150,000 gallons of denatured	million Btus per hour
#41	Kan car loading fack	ethanol per hour.	heat input. The air-
		culation per flour.	assisted flare shall be
			operational on and after
			the initial startup of Unit
			#26.
#22	Grain milling. The grain is transferred	24 tons per hour	Baghouse
	from the surge bin to a hammer mill. The		
	hammer mill grinds the grain into flour.		
	The owner or operator may construct and		
	operate this grain milling process and		
	baghouse during the term of this permit.		
#23	Grain milling. The grain is transferred	24 tons per hour	Baghouse
	from the surge bin to a hammer mill. The	-	
	hammer mill grinds the grain into flour.		
	The owner or operator may construct and		
	operate this grain milling process and		
	baghouse during the term of this permit.		
#24	Grain milling. The grain is transferred	24 tons per hour	Baghouse
	from the surge bin to a hammer mill. The		
	hammer mill grinds the grain into flour.		
	The owner or operator may construct and		
	operate this grain milling process and		
#25	baghouse during the term of this permit.	24 tong of	Doobouse
#25	Grain milling. The grain is transferred	24 tons of grain per hour	Baghouse
	from the surge bin to a hammer mill. The		
	hammer mill grinds the grain into flour. The owner or operator may construct and		
	operate this grain milling process and		
	baghouse during the term of this permit.		
	bagnouse during the term of this permit.		
			l

<b>T</b> T •4	D	Maximum	Control
Unit	Description	Operating Rate	Device
#26	The owner or operator may construct and operate four fermenters, a distillation system, and a wet scrubber during the term of this permit. The distillation system consists of the beer stripper, rectifier, side stripper, two molecular sieves, and evaporators.	Fermenters equal 165 tons of mash per hour.  Distillation equals 38,000 gallons of beer per hour.	Wet scrubber. The exhaust gases from the wet scrubber shall be routed through the seven chambered regenerative thermal oxidizer associated with Unit #6. The owner or operator may bypass the seven chambered regenerative thermal oxidizer under the terms of this permit.
#27	Grain milling. The grain is transferred from the surge bin to a hammer mill. The hammer mill grinds the grain into flour. The owner or operator may construct and operate this grain milling process and baghouse during the term of this permit.	24 tons of grain per hour	Baghouse
#28	Grain milling. The grain is transferred from the surge bin to a hammer mill. The hammer mill grinds the grain into flour. The owner or operator may construct and operate this grain milling process and baghouse during the term of this permit.	24 tons of grain per hour	Baghouse
#29	The owner or operator may construct and operate a fluid bed cooler and baghouse during the term of this permit. The fluid bed cools the dried distiller grain and solubles.	30 tons of dried distiller grains and solubles per hour	Baghouse. The owner or operator shall route the exhaust gases from the baghouse through the ring dryer and seven chambered regenerative thermal oxidizer associated with Unit #6. The exhaust gases from the baghouse may bypass the ring dryer and seven chambered regenerative thermal oxidizer under the terms of this permit.
#30	The owner or operator may construct and operate a dried distillers grain and solubles silo and baghouse during the term of this permit.	30 tons dried distiller grain and solubles per hour	Baghouse

		Maximum	Control
Unit	Description	Operating Rate	Device
#31	The owner or operator may construct and	Not applicable	Not applicable
	operate an industrial cooling tower during		
	the term of this permit.		

#### 1.2 Proposed Revisions

Northern Lights Ethanol's renewal application requested several permit revisions and operational changes. Northern Lights Ethanol is proposing the following revisions:

- 1. The New Source Performance Standards applicability requirements be amended to require volatile organic (VOC) compound leak detection procedures be conducted in accordance with 40 CFR §§ 60.480a 60.489a, Standards of Performance for Equipment Leaks of VOC in the Synthetic Organic Chemicals Manufacturing Industry for Which Construction, Reconstruction, or Modification Commenced After November 7, 2006 Subpart VVa, over the current Subpart VV requirements.
- 2. As part of a consent decree, the U.S. Environmental Protection Agency (EPA), Region VIII is requiring Northern Lights Ethanol to request a permit modification to clarify the required test methodology when determining compliance with applicable volatile organic compound emission limits. Northern Lights Ethanol is requesting the following permit language be included in the permit renewal regarding stack testing requirements:
  - a. Required Test Methods. The owner or operator shall conduct all volatile organic compound mass emission performance tests in accordance with 40 CFR Part 51, Appendix M, Method 207 and 40 CFR Part 60, Appendix A, Method 18;
  - b. <u>Treatment of 2,3-Butanediol.</u> Due to difficulties associated with appropriate method detection limit, 2,3-Butanediol will be sampled through the chromatography column approximately 2.5 times faster than the maximum allowable sampling rate for the other volatile organic compound in the sampling program (e.g. acetaldehyde, acrolein, and ethyl acetate). This requirement applies only if the Method 207 results indicate that 2,3-Butanediol should be sampled as part of the Method 18 testing;
  - c. <u>Treatment of Non-Detects.</u> When summing analytes per Method 18, non-detect data will be included in the total volatile organic compound mass as one half of the compound method detection limit; except that, if all three performance test runs result in a non-detect measurement and the method detection limit is less than or equal to 1.0 part per million by volume on a dry basis, then all such non-detect data will be treated as zero.
- 3. An increase in the current ethanol production limit of 80 to 88 million gallons of undenatured ethanol during any 12-month rolling period as listed in current permit condition 7.15. Northern Lights Ethanol stated there are no physical modifications necessary to operate at this higher ethanol production rate. The increase is due to various process improvements that have increased ethanol yield.
- 4. An increase to the current grain processing limit of 816,870 to 899,360 tons of grain during any 12-month rolling period as listed in current permit condition 7.16. As with

- the annual ethanol production rate increase, Northern Lights Ethanol stated there are no physical modifications necessary to operate at this higher grain processing rate.
- 5. An increase to the current dried distiller grains and solubles production limit of 236,520 to 296,789 tons during any 12-month rolling period as listed in current permit condition 7.17. As with the annual ethanol production rate increase, Northern Lights Ethanol stated there are no physical modifications necessary to operate at this higher production rate.
- 6. An increase to the current dried distiller grains and solubles truck load out limit of 118,263 to 148,395 tons during any 12-month rolling period as listed in current permit condition 7.18. As with the annual ethanol production rate increase, Northern Lights Ethanol stated there are no physical modifications necessary to operate at the higher production rate.
- 7. Revisions to the short-term volatile organic compound emission limits, one short-term PM10 emission limit and one short-term carbon monoxide emission limit contained within the current Title V air quality operating permit.
- 8. Revision to the amount of denatured ethanol that can be loaded out by truck from 42,000,000 to 50,000,000 gallons of denatured ethanol.
- 9. Requesting the ability to load out E-85 by truck in addition to normal denatured ethanol loadout. E-85 can contain up to 30 percent denaturant with the remainder being 200-proof ethanol. Northern Lights Ethanol is requesting that the maximum E-85 loadout capacity on a 12-month rolling period be 2,510,000 gallons.
- 10. Requesting the flare bypass limit be reduced from 2.0 to 1.0 million gallons during any 12-month rolling period as listed in current permit condition 7.20.
- 11. Requesting permit condition 7.21 be modified to add normal maintenance activities to the requirement to route the fluid bed cooler (Unit #29) exhaust to the ring dryer (Unit #6) as combustion air. Northern Lights Ethanol stated this operation is necessary to perform preventative maintenance activities to the fluid bed cooler and the blown bag sensor associated with the fluid bed cooler baghouse. Northern Lights Ethanol believes these maintenance activities are very minimal and will not exceed 20 hours during any 12-month rolling period.

The proposed changes in the description of the existing equipment have been completed. Table 1-2 provides the current description of the existing equipment that will be evaluated in the renewal process.

Table 1-2 – Existing Description of Permitted Units, Operations, and Processes

1 11010	1 2 Existing Description of 1 continued Citi	is, operations, tilta i rocesses	
		Maximum	Control
Unit	Description	Operating Rate	Device
#1	Grain receiving, grain transfer via	Transfer rate equals 840 tons	Baghouse
	enclosed conveyor belt systems, and	of grain per hour	
	storage bin loading. Trucks and railcars		
	transport grain to the ethanol plant and	Permanent grain storage	
	dump grain into receiving pits located in a	capacity is 2,810,000 bushels	
	partially enclosed building. Elevator legs		
	transport the grain from the receiving pit		
	to grain storage bins.		

		Maximum	Control
Unit	Description	Operating Rate	Device
	Dried distiller grain and solubles load out	220 tons of dried distiller	
	by truck or railcar.	grain and solubles per hour	
#2	Grain cleaning, grain transfer, and surge	140 tons of grain per hour	Baghouse
	bin loading. The grain is transferred from		
	the grain storage bins to a grain cleaner.		
	The cleaned corn is transferred to a surge		
	bin.		
#4	Fermentation system. Ethanol is produced	165 tons of mash per hour	Wet scrubber. The
	from the fermentation process. The		owner or operator shall
	fermentation process consists of four		route the exhaust gases
	fermentation tanks and the liquid beer is		from the wet scrubber to
	stored in a beer well.		the regenerative thermal
	Distillation process. The distillation	34,026 gallons of beer per	oxidizer associated with
	process distills the liquid beer from the	hour	Unit #6, except as
	fermentation process. The distillation		allowed under the terms
	process consists of the beer stripper,		of this permit.
	rectifier, side stripper, molecular sieve,		
	and evaporator.		
#6	Dryer system – Two ICM dried distiller	30 tons of dried distiller	Seven chambered
	grains and solubles dryers operated in	grains and solubles per hour.	regenerative thermal
	parallel and a ring dryer operated in series		oxidizer
	with the two ICM dryers. The two ICM	The two ICM dryers rated at	
	dryers include an ICM multi-cyclone to	55 million Btus per hour per	
	collect product. The ring dryer includes a	dryer.	
	Barr-Rosin multi-cyclone to collect		
	product. All three dryers are fired with	The ring dryer rated at 60	
	natural gas.	million Btus per hour.	
	Seven centrifuges used to separate the	Five at 25 tons per hour and	
	thin stillage and solids fractions of the wet	two at 50 tons per hour.	
	distiller grain.		
	Exhaust gases from Unit #4 and #26.	See applicable unit	
	Seven chambered regenerative thermal	42 million Btus per hour	
	oxidizer fired with natural gas		
#7	Dried distiller grains and solubles receiver	30 tons per hour	MAC baghouse
	system.		
#8	Dried distiller grains and solubles silo	27 tons per hour	MAC baghouse
	loading process.		
#9	Industrial cooling tower $#1 - 3$ cell towers	18,000 gallons per minute	Not applicable
#10	Boiler #1 – 2001 Johnston steam boiler,	81 million Btus per hour heat	Low NO <sub>X</sub> burner
	Model #PFTS2000-3G150S, fired with	input.	
	natural gas and diesel.		

		Maximum	Control
Unit	Description	Operating Rate	Device
#11	Boiler $#2 - 2001$ Johnston steam boiler,	81 million Btus per hour heat	Low NO <sub>X</sub> burner
	Model #PFTS2000-3G150S, fired with	input.	
114 =	natural gas and diesel.	100,000 11	
#15	Tank #1 – 2001 aboveground ethanol	180,000 gallons	Internal floating roof
<b>Д1</b> С	storage tank.	180,000 gallons	Internal flacting need
#16	Tank #2 – 2001 aboveground ethanol storage tank.	180,000 gailons	Internal floating roof
#17	Tank #3 – 2001 aboveground denatured	1,000,000 gallons	Internal floating roof
π1/	ethanol storage tank.	1,000,000 ganons	Internal Hoating 1001
#18	Tank #4 – 2001 aboveground denatured	1,000,000 gallons	Internal floating roof
20	ethanol storage tank.	1,000,000 gazzona	
#19	Tank #5 – 2001 aboveground denaturant	65,000 gallons	Internal floating roof
	(gasoline) storage tank.		
#20	Submerged truck loading rack	39,000 gallons of denatured	Air-assisted flare. The
		ethanol per hour.	owner or operator shall
			route the exhaust gases
	Air-assisted flare	6.4 million Btus per hour	from the truck loading
		heat input	rack to the flare, except
			as allowed under the
#21	Rail car loading rack	150,000 gallons of denatured	terms of this permit.
#41	Rail car loading rack	ethanol per hour.	The owner or operator shall route the exhaust
		culation per flour.	gases from the rail car
			loading rack to the flare
			associated with Unit
			#20, except as allowed
			under the terms of this
			permit.
#22	Hammer mill #1	22 tons per hour	Baghouse
#23	Hammer mill #2	22 tons per hour	Baghouse
#24	Hammer mill #3	22 tons per hour	Baghouse
#25	Hammer mill #4	22 tons per hour	Baghouse
#26	Four fermenters.	Fermenters - 165 tons of	Wet scrubber. The
	Distillation aviatem assisting of hour	mash per hour.	owner or operator shall
	Distillation system consisting of beer stripper, rectifier, side stripper, two	Distillation equals 74,490 gallons of beer per hour.	route the exhaust gases from the wet scrubber to
	molecular sieves, and evaporators.	ganons of beef per nour.	the regenerative thermal
	morecular sieves, and evaporators.		oxidizer associated with
			Unit #6, except as allowed under the terms of this permit.

		Maximum	Control
Unit	Description	Operating Rate	Device
#27	Hammer mill #5	22 tons per hour	Baghouse
#28	Hammer mill #6	22 tons per hour	Baghouse
#29	Fluid bed cooler for the dried distiller grains and solubles.	30 tons of dried distiller grains and solubles per hour	Baghouse. The owner or operator shall route the exhaust gases from the baghouse to the ring dryer associated with Unit #6, except as allowed under the terms of this permit.
#30	Dried distiller grains and solubles silo.	3,000 ton capacity. Loading rate of 27 tons per hour.	Baghouse
#31	Industrial cooling tower #2 – 3 cell towers	18,000 gallons per minute	Not applicable

#### 2.0 New Source Performance Standards

DENR reviewed the New Source Performance Standards listed in 40 CFR Part 60 to determine if any of the federal New Source Performance Standards are applicable to this facility. The following may be applicable.

#### 2.1 Standards for Grain Elevators

The provisions under 40 CFR Part 60, Subpart DD is applicable to the following grain elevators:

- 1. The provisions of this subpart are applicable to any grain terminal elevator, which has a permanent grain storage capacity of 2,500,000 bushels. A grain terminal storage elevator means any grain elevator except those located at animal food manufacturers, pet food manufactures, cereal manufacturers, breweries, and livestock feedlots; or
- 2. The provisions of this subpart are applicable to any grain storage elevator, which has a permanent grain storage capacity of 1,000,000 bushels. A grain storage elevator means any grain elevator located at any wheat flour mill, wet corn mill, dry corn mill (human consumption), rice mill, or soybean oil extraction plant; and
- 3. Commences construction, modification, or reconstruction after August 3, 1978.

Northern Lights Ethanol is considered a grain terminal elevator. The permanent grain storage capacity for this plant with the two additional grain storage bins is 2,810,000 bushels. Therefore, this new source performance standard is applicable.

In accordance with 40 CFR § 60.300(a), the affected operations at the ethanol plant are each unloading, loading, grain dryer, and all grain handling operations. This affects the following operations:

- 1. Unit #1 Receiving; and
- 2. Grain Bin #3 and #4.

The new grain handling conveyors that Northern Lights Ethanol installed are part of a totally enclosed system with no vents. Unit #1 is applicable because the conveyor systems will be aspirated to the existing baghouse. In accordance with 40 CFR § 60.302(b), emissions from the baghouse associated with Unit #1 shall not exceed the corresponding process emission limits:

- 1. 0.01 grains per dry standard cubic foot; and
- 2. 0% opacity.

Northern Lights Ethanol has submitted stack test results for Unit #1 demonstrating compliance with both the 0.01 grains per dry standard cubic foot and 1.0 pounds per hour particulate emission limit.

In addition, in accordance with 40 CFR § 60.302(c), fugitive dust emissions from the following operations shall not exceed the corresponding opacity limit:

- 1. Any individual truck unloading station, railcar unloading station, or railcar loading station, which exhibits greater than 5% opacity;
- 2. Any grain handling operation which exhibits greater than 0% opacity; and
- 3. Any truck loading station which exhibits greater than 10% opacity.

The two new grain bins that Northern Lights Ethanol installed are vented to the baghouse associated with Unit #1. These grain bins are also equipped with vents that allow for the possibility of fugitive dust. Therefore, they must meet the 0% opacity grain handling limit.

#### 2.2 Standards Applicable to Boilers

There are three New Source Performance Standards for fossil fuel-fired steam generators. The three standards are applicable to the following steam generators:

- 1. 40 CFR Part 60, Subpart D: applicable to a steam generator with a maximum operating rate of 250 million Btus per hour or more and commenced construction after August 17, 1971:
- 2. 40 CFR Part 60, Subpart Db: applicable to a steam generator with a maximum operating rate of 100 million Btus per hour or more and commenced construction after June 19, 1984; and
- 3. 40 CFR Part 60, Subpart Dc: applicable to a steam generator with a minimum design heat input capacity equal to or greater than 10 million Btus per hour but less than or equal to 100 million Btus per hour and commenced construction after June 9, 1989.

Both boilers (Unit #10 and #11) were constructed after 1989 and have a maximum heat input greater than 10 million Btus per hour but less than 100 million Btus per hour. 40 CFR 60, Subpart D and Db are not applicable but Dc is applicable. Subpart Dc does not have any

emission limits or requirements for boilers fired with natural gas; but does have requirements for boilers fired with diesel. Therefore, the Title V air quality operating permit will specify only natural gas and distillate oil may be used to fire the boilers and permit conditions specific to the new source performance standard requirements for burning distillate oil. In addition, Northern Lights Ethanol will have to meet the applicable general requirements in 40 CFR Part 60, Subpart A.

Northern Lights Ethanol has already demonstrated compliance with the initial fuel oil sulfur performance tests, initial visibility test, and submitted the initial startup notification. Therefore, these requirements have already been satisfied and will not be incorporated in the draft permit.

## 2.3 Standards Applicable to Storage Tanks

There are three New Source Performance Standards for storage vessels. The three standards are applicable to the following storage vessels:

- 1. 40 CFR Part 60, Subpart K: applicable to storage vessels for petroleum liquids capable of storing greater than 40,000 gallons and commenced construction after June 11, 1973 but prior to May 19, 1978;
- 2. 40 CFR Part 60, Subpart Ka: applicable to storage vessels for petroleum liquids capable of storing greater than 40,000 gallons and commenced construction after May 18, 1978; and
- 3. 40 CFR Part 60, Subpart Kb: applicable to storage vessels for volatile organic liquids capable of storing 75 cubic meters (approximately 19,813 gallons) or greater and commenced construction after July 23, 1984.

Northern Lights Ethanol submitted application forms for six tanks. Past application reviews were reviewed to determine if there was a sixth tank. During the 2006 Title V air quality operating permit renewal, a sixth tank was proposed but later removed from the application. A review of an aerial photograph taken in 2010 indicates there are only five tanks.

All five tanks commenced construction after July 23, 1984. Therefore, subpart K and Ka are not applicable. See Table 2-1 for tank size and the true vapor pressure of the liquids being stored in the tanks.

Table 2-1 – Tank and Volatile Organic Liquid Specifications

Tank		Capacity		True Vapor Pressure	Subpart Kb
Unit	ID	(Gallons)	(Cubic meters)	(Kilo Pascal)	Applicable
#15	#1	180,000	681	5.4	Yes
#16	#2	60,000	227	5.5	Yes
#17	#3	1,000,000	3,785	35	Yes
#18	#4	1,000,000	3,785	5.5	Yes
#19	#5	180,000	681	5.4	Yes

The capacities of Tank #1, #2, #3, #4, and #5 are all greater than 40 cubic meters. Therefore, Tank #1, #2, #3, #4, and #5 are subject to subpart Kb.

The capacity of Tank #1, #2, #3, #4, and #5 are greater than 151 cubic meters. The maximum true vapor pressure of the tanks is greater than 5.2 kilo Pascal (kPa) and less than 76.6 kPa. Therefore, Tank #1, #2, #3, #4 and #5 must meet all requirements of this subpart and the notification requirements in 40 CFR § 60.7. Based on the application, Northern Lights Ethanol is installed a fixed roof with an internal floating roof on Tank #1, #2, #3, #4 and #5. Therefore, the permit conditions will be specific to the requirements for a fixed roof with an internal floating roof.

The requirements include maintaining records of the size and dimension of the storage tanks, specific requirements for the tank cover, type of volatile organic liquid stored, period of storage, and maximum true vapor pressure of the volatile organic liquid during the storage period. Northern Lights Ethanol will also have to meet the applicable general requirements in 40 CFR Part 60, Subpart A.

#### 2.4 Standards for Synthetic Organic Chemical Manufacturing

There are two New Source Performance Standards for synthetic organic chemical manufacturing industries. The two standards are applicable to the following:

- 1. 40 CFR Part 60, Subpart VV is applicable to affected facilities in the synthetic organic chemical manufacturing industry, of which ethanol is included; and commence construction, reconstruction or modification after January 5, 1981, but before November 8, 2006 and the capacity of the plant is more than 1,000 megagrams per year of ethanol; and
- 2. 40 CFR Part 60, Subpart VVa is applicable to affected facilities in the synthetic organic chemical manufacturing industry that commence construction, reconstruction, or modification after November 7, 2006 and the capacity of the plant is more than 1,000 megagrams per year of ethanol.

It has already been determined in previous reviews that Northern Lights Ethanol is subject to 40 CFR Part 60, Subpart VV. This subpart is applicable because construction commenced after January 5, 1981, and the capacity of the plant is more than 1,000 megagrams per year of ethanol.

Northern Lights Ethanol requested that DENR require its operations to meet the requirements under 40 CFR Part 60, Subpart VVa. DENR compared the requirements between the two subparts and determined that subpart VVa is more stringent. Therefore, DENR will only include the requirement from VVa.

#### 2.5 Other Applicable New Source Performance Standards

DENR reviewed the other New Source Performance Standards and determined there are no other standards applicable to Northern Lights Ethanol.

#### 3.0 New Source Review

In accordance with ARSD 74:36:10:01, the new source review regulations apply to areas of the state which are designated as nonattainment pursuant to the Clean Air Act for any pollutant regulated under the Clean Air Act. This facility is located near Big Stone City, South Dakota, which is in attainment or unclassifiable for all the criteria air pollutants regulated under the Clean Air Act. Therefore, Northern Lights Ethanol is not subject to new source review.

# 4.0 Prevention of Significant Deterioration

A prevention of significant deterioration (PSD) review applies to new major stationary sources and major modifications to existing major stationary sources in areas designated as attainment under Section 107 of the Clean Air Act for any regulated air pollutant. The following is a list of regulated air pollutants under the PSD program:

- 1. Total suspended particulate (PM);
- 2. Particulate with a diameter less than or equal to 10 microns (PM10);
- 3. Particulate with a diameter less than or equal to 2.5 microns (PM2.5);
- 4. Sulfur dioxide (SO<sub>2</sub>);
- 5. Nitrogen oxides (NOx);
- 6. Carbon monoxide (CO);
- 7. Ozone measured as volatile organic compounds (VOCs);
- 8. Lead:
- 9. Fluorides
- 10. Sulfuric acid mist;
- 11. Hydrogen sulfide;
- 12. Reduced sulfur compounds;
- 13. Total reduced sulfur; and
- 14. Greenhouse gases (carbon dioxide, methane, nitrous oxide, etc.).

If the source is considered one of the 28 named PSD source categories listed in Section 169 of the federal Clean Air Act, the major source threshold is 100 tons per year of any regulated air pollutant, except for greenhouse gases. The major source threshold for all other sources is 250 tons per year of any regulated air pollutant, except for greenhouse gases.

The Environmental Protection Agency (EPA) recently published and implemented a final rule that no longer lists ethanol plants as a chemical manufacturing plant. Therefore, Northern Lights Ethanol is not classified as a chemical manufacturing plant or one of the 28 listed source categories for PSD regulations and the major source threshold is 250 tons per year, except for greenhouse gases.

According to the Clean Air Act, once a pollutant is regulated under any part of the Act, (as was the case with greenhouse gas emissions after the motor vehicle regulations were finalized in

March 2010) major new sources or major modifications are subject to the PSD program and Title V air quality operating permit program. Under the Clean Air Act, PSD and Title V air quality operating permits are required for all sources that emit a regulated air pollutant above 100 or 250 tons per year, depending on the source. This threshold, if applied to greenhouse gases, would greatly increase the number of facilities requiring a PSD review or Title V air quality operating permit. Based on administrative necessity, EPA increased these thresholds through the "Tailoring Rule."

On May 13, 2010, EPA issued the final version of the "Tailoring Rule" for greenhouse gas emissions. The major source threshold for greenhouse gases is listed below:

- 1. New PSD source because of a criteria air pollutant, the major source threshold for greenhouse gases is 75,000 tons per year of carbon dioxide equivalent or more;
- 2. New PSD source if greenhouse gas emissions are 100,000 tons per year of carbon dioxide equivalent or more;
- 3. For an existing PSD source because of a criteria air pollutant, a major modification for greenhouse gases is an increase of 75,000 tons per year of carbon dioxide equivalent or more;
- 4. For an existing non-PSD source that has the potential to emit 100,000 tons per year of carbon dioxide equivalent emissions or more, a major modification for greenhouse gases is an increase of 75,000 tons per year of carbon dioxide equivalent or more; and
- 5. In addition to subsection (2) and (4), a specific greenhouse gas, without calculating the carbon dioxide equivalent, also needs to emit greater than 100 or 250 tons per year, whichever is applicable, to be regulated.

#### 4.1 Current Emission and Operational Limits

The current permit contains enforceable permit conditions to ensure actual emissions from the ethanol plant do not exceed the major source threshold under the PSD program. Northern Lights Ethanol's short term emission limits restrict the facility's potential emissions to less than 95 tons per year for criteria air pollutants. In addition, the permit contains plant wide emission limits for each criteria air pollutant of 95 tons per 12-month rolling total. Table 4-1 lists Northern Lights Ethanol's short term emission limits as taken from section 7.0 of the current permit.

<i>Table 4-1 – Cu</i>	irrent Short	Term E	mission .	Limits
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		Control	PM10	SO2	NOx	VOCs	CO
Unit	Description	Device	(lbs/hr)	(lbs/hr)	(lbs/hr)	(lbs/hr)	(lbs/hr)
#1	Grain receiving	Baghouse	1.0				
#2	Grain cleaning	Baghouse	0.1				
#3	Flour conveying	Baghouse	1.0				
#4	Fermentation #1	Wet scrubber				15.0	
#5	Distillation process	Wet scrubber				2.0	
#6	Dried distiller grains	Thermal	7.0	4.2	14.0	6.0	12.0
	and solubles dryer	oxidizer					

		Control	PM10	SO2	NOx	VOCs	CO
Unit	Description	Device	(lbs/hr)	(lbs/hr)	(lbs/hr)	(lbs/hr)	(lbs/hr)
#7	Dried distiller grains	Baghouse	1.2				
	and solubles receiver						
#8	Dried distiller grains	Baghouse	0.1				
	and solubles silo						
#10	Boiler #1 (natural gas)	Not	0.3	0.1	3.6	0.3	3.2
	Boiler #1 (diesel)	applicable	0.8	42.2	8.9	0.8	6.5
#11	Boiler #2 (natural gas)	Not	0.3	0.1	3.6	0.3	3.2
	Boiler #2 (diesel)	applicable	0.8	42.2	8.9	0.8	6.5
#22	Hammer mill	Baghouse	0.5				
#23	Hammer mill	Baghouse	0.5				
#24	Hammer mill	Baghouse	0.5				
#25	Hammer mill	Baghouse	0.5				
#26	Fermentation #2	Wet scrubber				15.0	
#27	Hammer mill	Baghouse	0.5				
#28	Hammer mill	Baghouse	0.5				
#29	Fluid bed cooler	Baghouse	1.5			7.0	
#30	Dried distiller grains	Baghouse	0.1				
	and solubles loading	_					

In addition to the short term and long term limits, Northern Lights Ethanol accepted operational limits that restrict the operation of certain units. Table 4-2 provides a summary of the existing operational limits derived from Chapter 7.0 of the current permit.

Table 4-2 – Current Operational Limits

Unit	Description	Operational Limit	
#4/#26	Fermentation #1 and #2	Bypass the regenerative thermal oxidizer associated with	
		Unit #6 for up to 500 hours per unit per 12-month rolling	
		period.	
#10/#11	Boiler #1 and #2	Combined operational limit of less than or equal to 3,600	
		hours per 12-month rolling period while burning diesel.	
		Combined operational limit of less than or equal to 8,000	
		hours per 12-month rolling period while burning natural	
		gas if diesel was burned during the 12-month period.	
		Combined operational limit of less than or equal to	
		15,200 hours per 12-month rolling period while burning	
		natural gas if natural gas is the only fuel burned during	
		the 12-month period.	
#20	Ethanol truck load out	Load out limit less than or equal to 42,000,000 gallons of	
		denatured ethanol per 12-month rolling period.	
#20/#21	Flare	Truck or railcar load out limited to 2,000,000 gallons per	
		12-month rolling period when the flare has malfunctioned	

Unit	Description	Operational Limit	
		or is not in operation.	
#29	Fluid bed cooler	Exhaust from Unit #29 shall be the sole combustion air	
		source for the ring dryer associated with Unit #6 when	
		both operations are in operation.	
	Plant wide	Ethanol production limited to 80 million gallons of	
		undenatured ethanol per 12-month rolling period.	
		Grain process limited to 816,870 tons of grain per 12-	
		month rolling period.	
		Dried distiller grain and solubles production limited to	
		236,520 tons per 12-month rolling period.	
		Truck load out limited to less than or equal to 118,263	
		tons of dried distiller grain and solubles per 12-month	
		rolling period.	
		All haul roads and parking lots on the north side of the	
		facility where the grain and dried distiller grains and	
		solubles truck traffic occurs shall be paved.	

#### 4.2 Proposed Revisions to the Emission and Operational Limits

Since the Title V air quality operating permit was issued in February 2009, EPA has determined that ethanol plants are no longer considered one of the 28 named PSD source categories listed in Section 169 of the federal Clean Air Act. Therefore, fugitive dust emissions are no longer considered in determining if Northern Lights Ethanol is subject to the PSD program and the haul road and parking lot paving requirements along with an associated permit conditions will be removed from the permit.

In addition, Northern Lights Ethanol has removed Unit #3 and routes the exhaust gases from Unit #5 through the wet scrubber associated with Unit #4. Therefore, the emission and operational limits associated with these two units will be removed from the permit.

Northern Lights Ethanol proposed changes to the existing short term limits for several units and certain criteria air pollutants. Northern Lights Ethanol proposed changes in the short term limits are displayed in Table 4-3.

Table 4-3 – Proposed Revisions to the Short Term Limits

	•	PM10	CO	VOC
Unit	Description	(lbs/hr)	(lbs/hr)	(lbs/hr)
#4	Fermentation process			10.1
#6	Dried distiller grains and solubles dryers	10.0	15.0	10.0
#26	Fermentation process			15.2

Northern Lights Ethanol also proposed changes to the operational limits which are displayed in Table 4-4.

Table 4-4 – Proposed Revisions to Operational Limits

Unit	Description	Operational Limit	
#20	Ethanol truck load out	Load out limit less than or equal to 50,000,000 gallons of	
		denatured ethanol per 12-month rolling period.	
		Load out limit for E-85 less than 2,510,000 gallons per	
		12-month period	
#20/#21	Flare	Truck or railcar load out limited to 1,000,000 gallons per	
		12-month rolling period when the flare has malfunctioned	
		or is not in operation.	
	Plant wide	Ethanol production limited to 88 million gallons of	
		undenatured ethanol per 12-month rolling period.	
		Grain process limited to 899,360 tons of grain per 12-	
		month rolling period.	
		Dried distiller grain and solubles production limited to	
		296,789 tons per 12-month rolling period.	
		Truck load out limited to less than or equal to 148,395	
		tons of dried distiller grain and solubles per 12-month	
		rolling period.	

Northern Lights Ethanol is requesting that the exhaust gases from the fluid bed cooler (Unit #29) be allowed to bypass the ring dryer associated with Unit #6 for up to 20 hours during normal maintenance activities associated with Unit #29. Northern Lights Ethanol stated this operation is necessary to perform preventative maintenance activities to the fluid bed cooler and the blown bag sensor associated with the fluid bed cooler baghouse. However, if Northern Lights Ethanol is performing preventative maintenance, the fluid bed cooler will more than likely be shut down for safety reasons. If Northern Lights Ethanol is performing preventative maintenance on the baghouse or repairing a bag, the fluid bed cooler should also be shut down. Therefore, the department does not believe this proposed change is necessary.

# **4.3** Compliance with Short Term Limits

Table 4-5 provides a summary of the most recent stack tests for the applicable permitted units and pollutant.

Table 4-5 – Summary of Stack Test Results

Date	Unit	Pollutant	Results	Notes
02/15/11	#4	VOC	6.3 pounds per hour	Consent decree
	#6	VOC	3.3 pounds per hour	Consent decree
	#26	VOC	13.3 pounds per hour	Consent decree
	#29	VOC	3.0 pounds per hour	Consent decree
01/15/08	#10	NOx	7.8 pounds per hour	Diesel
		CO	4.5 pounds per hour	Diesel
	#23	PM	0.05 pounds per hour	

Date	Unit	Pollutant	Results	Notes
	#24	PM	0.03 pounds per hour	
08/01/07	#6	PM	2.8 pounds per hour	
		NOx	11.4 pounds per hour	
		CO	8.6 pounds per hour	
06/19/07	#1	PM	0.08 pounds per hour	
	#2	PM	0.01 pounds per hour	
	#7	PM	0.39 pounds per hour	
	#8	PM	0.01 pounds per hour	
	#29	PM	0.32 pounds per hour	
	#11	NOx	2.7 pounds per hour	Natural gas
		CO	0.03 pounds per hour	Natural gas
12/17/02	#5	VOC	0.3 pounds per hour	Speciation
	#10	PM	0.25 pounds per hour	Natural gas
		VOC	0.1 pounds per hour	Natural gas
		PM	0.42 pounds per hour	Diesel
		VOC	0.2 pounds per hour	Diesel

Table 4-6 compares the stack test results to the short term limits in the current Title V air quality permit and those proposed by Northern Lights Ethanol.

Table 4-6 – Comparison of Stack Test Results to Short Term Limit

Unit	Pollutant	Short Term	Stack Test	In Compliance
#1	PM	1.0 pounds per hour	0.08 pounds per hour	Yes
#2	PM	0.1 pounds per hour	0.01 pounds per hour	Yes
#4	VOC	10.1 pounds per hour	6.3 pounds per hour	Yes
#6	PM	10.0 pounds per hour	2.8 pounds per hour	Yes
	NOx	14.0 pounds per hour	11.4 pounds per hour	Yes
	CO	15.0 pounds per hour	8.6 pounds per hour	Yes
	VOC	10.0 pounds per hour	3.3 pounds per hour	Yes
#7	PM	1.2 pounds per hour	0.39 pounds per hour	Yes
#8	PM	0.1 pounds per hour	0.01 pounds per hour	Yes
#10	PM	0.8 pounds per hour	0.42 pounds per hour	Yes
	NOx	8.9 pounds per hour	7.8 pounds per hour	Yes
	CO	6.5 pounds per hour	4.5 pounds per hour	Yes
	VOC	0.8 pounds per hour	0.2 pounds per hour	Yes
#11	NOx	8.9 pounds per hour	2.7 pounds per hour	Yes
	CO	6.5 pounds per hour	0.03 pounds per hour	Yes
#23	PM	0.5 pounds per hour	0.05 pounds per hour	Yes
#24	PM	0.5 pounds per hour	0.03 pounds per hour	Yes
#26	VOC	15.2 pounds per hour	13.3 pounds per hour	Yes
#29	PM	1.5 pounds per hour	0.32 pounds per hour	Yes
	VOC	7.0 pounds per hour	3.0 pounds per hour	Yes

The stack test results indicate Northern Lights Ethanol is capable of meeting the current short term limits and the proposed changes to the short term limits.

#### 4.4 Potential Controlled Emissions

Table 4-7 summarizes the potential emissions from the permitted units under the short term and operational limits proposed by Northern Lights Ethanol. Potential emissions for each applicable pollutant are calculated from the maximum design capacity listed in the application, the short term emission limits in Table 4-1, as revised in Table 4-3, operational limits in Table 4-2, as revised in Table 4-4, and assuming the unit operates every hour of every day of the year (8,760 hours per year), except where noted in Table 4-2 and 4-4.

Table 4-7 –Potential Controlled Emissions

		PM10	SO <sub>2</sub>	$NO_X$	VOC	CO
Unit	Description	(tons/year)	(tons/year)	(tons/year)	(tons/year)	(tons/year)
#1 Grain receiving		4.4				
#2	Grain cleaning	0.4				
#4	Fermentation #1				2.5	
#6	Dried distiller grain	43.8	18.4	61.3	43.8	65.7
	and solubles dryers					
#7	Dried distiller grain	5.3				
	and solubles receiver					
#8	Dried distiller grain	0.4				
	and solubles silo					
#10/#11 <sup>1</sup>	Boiler #1 and #2	2.6	76.4	30.4	2.6	24.5
#22	Hammer mill #1	2.2				
#23	Hammer mill #2	2.2				
#24	Hammer mill #3	2.2				
#25	Hammer mill #4	2.2				
#26	Fermentation #2				3.8	
#27	Hammer mill #5	2.2				
#28	Hammer mill #6	2.2				
#29	Fluid bed cooler	6.6			30.7	
#30	Dried distiller grain	0.4				
	and solubles loading					
#15-#19	Tank #1 through #5				1.4	
Fugitive	Equipment leaks				5.5	
	Load out without				5.6	
	flare					
	<b>Facility Emissions</b>	71	95	92	96	90

<sup>&</sup>lt;sup>1</sup> – The potential emissions are based on the operational limit that produces the greatest amount of air emissions which is burning natural gas for 8,000 hours and diesel for 3,600 hours per 12-month rolling period.

DENR assumed the particulate matter less than or equal to 2.5 microns in diameter (PM2.5) emissions are equivalent to the PM10 emission rates. Therefore, the PM2.5 potential to emit will be less than the major threshold under the PSD program. DENR will place PM2.5 short term and long term limits in the Title V air quality operating permit.

DENR calculated the potential controlled emissions based on Unit #29 emitted 100% out of its own stack (e.g., none of the exhaust air flowing to the ring dryer). Based on the potential controlled emissions from the entire facility, Northern Lights Ethanol is capable of maintaining its potential controlled emissions below the major source threshold under the PSD program. Therefore, DENR is going to remove the requirements that exhaust gases from Unit #29 must be used as the sole combustion air source for the ring dryer associated with Unit #6.

Even with the proposed changes to the short term limits, the plant wide limits will stay below 100 tons per year for criteria air pollutants.

#### 4.3 Potential to Emit for Greenhouse Gases

DENR uses stack test results to determine air emissions whenever stack test data is available from the source or a similar source. When stack test results are not available, DENR relies on manufacturing data, material balance, EPA's Compilation of Air Pollutant Emission Factors (AP-42, Fifth Edition, Volume 1) document, the applicant's application, or other methods to determine potential air emissions.

Northern Lights Ethanol is considered an existing non-PSD source due to the operational limits in their existing Title V air quality operating permit. The next step is to determine if Northern Lights Ethanol has the potential to emit 100,000 tons per year of carbon dioxide equivalent emissions or more. There are six regulated greenhouse gases which are listed below:

- 1. Carbon dioxide;
- 2. Nitrous oxide;
- 3. Methane;
- 4. Hydrofluorocarbons;
- 5. Perfluorocarbons: and
- 6. Sulfur hexafluoride.

There are two options for operating the two boilers. The first option allows Northern Lights Ethanol to fire the two boilers with natural gas for 8,000 hours and diesel for 3,600 hours combined during any 12-month period. The second option allows Northern Lights Ethanol to fire the two boilers strictly on natural gas for 15,200 hours per 12-month rolling period. Each boiler is rated at 81 million Btus per hour. Under the first scenario, Northern Lights Ethanol is capable of burning 648 million Btus and 2,082,857 gallons of diesel per 12-month period assuming natural gas has a heat input value of 1,000 Btus per cubic foot and the heat input for diesel is 140,000 Btus per gallon. In the second scenario, Northern Lights Ethanol is capable of burning 1,231 million cubic feet per 12-month period with the same assumption for natural gas heat

input. The greenhouse gas emission factors for firing these units with natural gas are from AP-42, Table 1.4-2, July 1998 and for diesel from AP-42, Table 1.3-3, 1.3-8, and 1.3-12, May 2010. Table 4-7 displays the emissions factors.

Table 4-7 – Greenhouse Gas Emission Factors

Pollutant	Natural Gas	Diesel
Carbon Dioxide	120,000 pounds per million cubic feet	22,300 pounds per 1,000 gallons
Nitrous Oxide	2.2 pounds per million cubic feet	0.26 pounds per 1,000 gallons
Methane	2.3 pounds per million cubic feet	0.052 pounds per 1,000 gallons

Northern Lights Ethanol also operates two dryers fired with natural gas in series with a maximum rated capacity of 55 million Btus per hour and a third dryer fired with natural gas with a maximum rated capacity of 60 million Btus per hour. The combined heat input to the dryers is 115 million Btus per hour which is equivalent to combusting 1,007 million cubic feet of natural gas per 12-month rolling period if you assume natural gas has a heat input of 1,000 Btus per cubic foot. The same natural gas emission factors for the boilers will be used to determine greenhouse gas emissions from the dryers. There are no operational limits for the dryers besides dried distiller grains and solubles output.

Using Equation 4-1, the appropriate emission factors and operating rates were used to determine the potential greenhouse gas emissions from the two boilers and two dryers. In the case of the greenhouse gases, the result of Equation 4-1 needs to be multiplied by 1, 310, and 21 for carbon dioxide, nitrous oxide, and methane, respectively, to convert the results to carbon dioxide equivalent. The potential emissions for the greenhouse gases are summarized in Table 4-8.

Equation 4-1 – Potential emissions from thermal oxidizers

$$Potential\left(\frac{tons}{yr}\right) = Fuel\ Use\left(\frac{MMcf}{year}\right) \times Emission\ Factor\left(\frac{lbs}{MMcf}\right) \div 2,000 \frac{lbs}{ton}$$

Table 4-8 – Potential Greenhouse Gas Emissions

	Potential Emissions		Potential
Pollutant	Boilers <sup>1</sup>	Dryers	Carbon Dioxide Equivalent
Carbon Dioxide	73,860 tons per year	60,420 tons per year	134,280 tons per year
Nitrous Oxide	1.4 tons per year	1.1 tons per year	775 tons per year
Methane	1.4 tons per year	1.2 tons per year	55 tons per year
		Total	135,110 tons per year

<sup>&</sup>lt;sup>1</sup> – The potential emissions were greater for the second option (e.g., 15,200 hours burning just natural gas) and are represented in this table.

Not considering any other greenhouse gas emissions from other sources, Northern Lights Ethanol is considered an existing non-PSD source with the potential to emit greater than 100,000 tons per year of carbon dioxide equivalent emissions. Therefore, Northern Lights Ethanol is considered a major source for greenhouse gases under the PSD program and future proposed

changes will have to be reviewed to determine if they would be considered a major modification under the PSD program.

#### 5.0 National Emission Standards for Hazardous Air Pollutants

DENR reviewed 40 CFR Part 61 to determine the applicability to this facility to any of the subparts and determined the following may be applicable.

#### 5.1 Standards for Benzene Waste Operations

Previously, DENR considered a few ethanol plants applicable to 40 CFR, Part 61, Subpart FF. The applicability was primarily based on ethanol plants being considered a chemical processing plant based on its Standard Industrial Classification Code 2869 – Industrial Organic Chemicals – Not Elsewhere Classified.

In a May 1, 2007, federal register notice, EPA finalized a rule that identified ethanol plants were not considered chemical processing plants. Therefore, a more detailed review of applicability to this rule will be conducted. The May 1, 2007, federal register notice finalizes proposed changes to the definition of "major emitting facility" in the Prevention of Significant Deterioration (PSD), Nonattainment New Source Review (NSR) and Title V air quality operating permit regulations in regards to what facilities are considered a chemical processing facility. This notice identifies the change does not affect applicability for other clean air act requirements. In particular EPA notes on page 24067 that "The applicability of differing rules is standard-specific and determinations were made under individual rulemakings and will not be changed under this rulemaking. There is no directive for the applicability to be the same across CAA programs and standards and applicability determinations need to be determined on a case-by-case, or standard-by-standard, basis."

However, EPA does note two specific items in this rule making: 1) On page 24063, EPA specified that it "did not believe that the term "chemical process plant" is subject to a "plain meaning interpretation." There is not a universally accepted definition of chemical process, and accepted definitions differ depending on whether you view the term from a purely scientific sense or from an engineering sense, or for economic purposes."; and 2) EPA specifies several new source performance standards and national emission standards for hazardous air pollutants that were potentially applicable to an ethanol plant. However, 40 CFR, Part 61, Subpart FF – National Emission Standard for Benzene Waste Operations, was not one of the listed standards that were considered potentially applicable to an ethanol plant.

The provisions 40 CFR, Part 61, Subpart FF – National Emission Standard for Benzene Waste Operations, applies to chemical manufacturing plants, coke byproduct recover plants, and petroleum refineries. Chemical manufacturing means any facility engaged in the production of chemicals by chemical, thermal, physical, or biological processes for use as a product, coproduct, by-product, or intermediate including but not limit to industrial organic chemicals, organic pesticide products, pharmaceutical preparations, paint and allied products, fertilizers, and

agricultural chemicals. Examples of chemical manufacturing plants include facilities at which process units are operated to produce one or more of the following chemicals: benzenesulfonic acid, benzene, chlorobenzene, cumene, cyclohexane, ethylene, ethylbenzene, hydroquinone, linear alklylbenzene, nitrobenzene, resorcinol, sulfolane, or styrene.

Ethanol is a chemical that is produced by a biological process (fermentation). However, ethanol is not one of the listed chemicals specified by definition. Therefore, just by the definition does not appear to be conclusive. So a more detailed review of the background of the rule is necessary.

In EPA's September 14, 1989, federal register proposed rulemaking notice, EPA stated that "Although EPA's analyses focus on chemical plants, petroleum refineries, coke by-product recovery plants, and commercial TSDF's, any standards placed on benzene waste operations would be applicable to any waste containing benzene." In EPA's December 15, 1989, federal register proposed rule clarification notice, EPA stated that "The proposed rule is intended to apply only to benzene wastes from chemical plants, petroleum refineries, coke by-product recovery plants, and commercial hazardous waste treatment, storage, and disposal facilities. Coverage of these industry categories is consistent with the background information used as the basis for the proposed rule". In addition, in EPA's March 5, 1992, federal register proposed rule notice, EPA state that "In the analysis performed to support the development of subpart FF, EPA determined that the NESHAP risk protection goals could be exceeded if benzene emissions from benzene waste operations were not controlled. Rather than require all facilities to install controls, EPA structured the applicability criteria of the rule in a way that would identify that subset of facilities where controls were needed." The preambles indicate EPA intended for all benzene waste streams at all chemical manufacturing facilities to be covered by this regulation.

However, this doesn't specify what is considered a waste or a benzene waste stream. In accordance with 40 CFR § 61.341, waste is defined as "any material resulting from industrial, commercial, mining, or agricultural operations that is discarded or is being accumulated, stored or physically, chemically, thermally, or biologically treated prior to being discarded, recycled or discharged." In accordance with 40 CFR § 61.341, waste stream is defined as "the waste generated by the particular process unit, product tank, or waste management unit.... Examples of a waste stream include process wastewater, product tank drawdown, sludge and slop oil removed from waste management units, and landfill leachate."

The ethanol production process does not produce benzene. To transport the ethanol, ethanol plants are required by the United States Bureau of Alcohol, Tobacco, Firearms and Explosives to add gasoline to its product. The purchased gasoline may contain small quantities of benzene. 100% ethanol and gasoline are initially stored in separate storage tanks. The 100% ethanol and gasoline are mixed together generally at a ratio of 19 to 1 (i.e. 95% ethanol and 5% gasoline) to produce denatured ethanol and are stored in a storage tank. The denatured ethanol is then loaded into railcars or trucks to be shipped offsite.

As noted in the March 7, 1990, federal register, the sources of benzene waste the rule was based on at chemical plants are as follows: "Wastes that contain benzene are generated from raw

materials, intermediates, and products that contain benzene at ... chemical plants that use or produce benzene... Certain chemical plants use benzene as a raw material or produce it as a product or as a co-product or by-product in processes that involve direct-contact with steam or cooling water. These processes generate wastewater, sludge, and organic liquid wastes that contain benzene." Based on the summary on the sources of benzene waste, ethanol plants do not meet the identified sources.

Gasoline or denatured ethanol, which includes amounts of benzene, would not be considered to meet this NESHAP's definition of waste until it is "discarded". For this to occur at an ethanol plant there would need to be a leak or a spill of the storage tanks or pipes between the tanks and loading racks. Upon collection of the gasoline or denatured ethanol from a spill, the material would then be classified as "remediation waste." However, remediation wastes are excluded from a facility's total annual benzene (TAB) calculation by this NESHAP to encourage facilities with a TAB less than 10 megagrams (10 tons) per year to undertake voluntary remediation actions.

The leak or spill of a storage tank would be maintained within a confined area. The leak or spill could then come into contact with rainwater to form an aqueous waste stream. However as noted in 40 CFR § 61.341, a stormwater waste stream is exempt from the standard. In addition as noted in the March 7, 1990, federal register, "Benzene in stormwater would result on an intermittent basis when spills or leaks are entrained by rainwater that falls at the facility. Existing regulations related to spills under both the CWA and RCRA should minimize the amount of benzene available for entrainment by storm water runoff. Because of this and considering that storm water runoff waste streams occur intermittently, EPA believes that on an annual average basis, benzene emissions from storm water will not contribute significantly to overall risk due to benzene emissions at a facility. Therefore, segregated storm water runoff is specifically excluded from today's benzene rule."

Even though Northern Lights Ethanol may be considered a chemical plant under this rule because of its standard industrial classification code, Northern Lights Ethanol is not applicable to this standard because of the following reasons:

- 1. Northern Lights Ethanol does not produce a chemical as listed in the rule;
- 2. Northern Lights Ethanol does not produce a waste stream identified in the rule making for chemical plants that rule was designed to cover;
- 3. Northern Lights Ethanol potential benzene waste is either specifically exempt from the rule or is exempt from inclusion in the TAB calculation to determine if controls are necessary; and
- 4. EPA did not identify this regulation as being applicable in other rule makings or in its enforcement documents for ethanol plants.

#### 5.2 Other NESHAP Standards

DENR reviewed the other national emission standards for hazardous air pollutants and determined there are no other standards applicable to this ethanol plant.

# 6.0 Maximum Achievable Control Technology Standards

#### **6.1 Potential HAP Emissions**

The federal Maximum Achievable Control Technology Standards are applicable to both major and area sources of hazardous air pollutants. A major source of hazardous air pollutants is defined as having the potential to emit 10 tons or more per year of a single hazardous air pollutant or 25 tons per year or more of a combination of hazardous air pollutants. An area source is a source that is not a major source of hazardous air pollutants.

DENR uses stack test results to determine air emissions whenever stack test data is available from the source or a similar source. When stack test results are not available, DENR relies on manufacturing data, material balance, EPA's Compilation of Air Pollutant Emission Factors (AP-42, Fifth Edition, Volume 1) document, the applicant's application, or other methods to determine potential air emissions.

Table 6-1 provides a summary of stack test results for hazardous air pollutants using the new stack testing method approved by EPA.

Table 6-1 – Summary of Stack Test Results

Date	Unit	Pollutant	Results	Notes
02/15/11	#4	Acetaldehyde	1.96 pounds/hour	Method 18
		Acrolein	0.004 pounds/hour	
		Methanol	0.02 pounds/hour	
		Formaldehyde	0.01 pounds/hour	
	#6	Acetaldehyde	0.31 pounds/hour	Method 18 – Unit #4 exhausted
		Acrolein	0.09 pounds/hour	to but Unit #26 bypassing
		Methanol	0.16 pounds/hour	regenerative thermal oxidizer
		Formaldehyde	0.17 pounds/hour	
	#6	Acetaldehyde	0.22 pounds/hour	Method 18 – Unit #4 and
		Acrolein	0.11 pounds/hour	#26 exhausting to
		Methanol	0.13 pounds/hour	regenerative thermal oxidizer
		Formaldehyde	0.01 pounds/hour	
	#26	Acetaldehyde	2.28 pounds/hour	Method 18
		Acrolein	0.01 pounds/hour	
		Methanol	0.03 pounds/hour	
		Formaldehyde	0.02 pounds/hour	
	#29	Acetaldehyde	0.06 pounds/hour	Method 18
		Acrolein	0.01 pounds/hour	
		Methanol	0.06 pounds/hour	
		Formaldehyde	0.02 pounds/hour	

Northern Lights Ethanol accepted operational limits to ensure their potential to emit does not exceed the major source threshold under the Title V air quality operating permit program for hazardous air pollutants. Table 6-2 provides a summary of hazardous air pollutant emissions based on the operational limits Northern Lights Ethanol accepted to avoid the Prevention of Significant Deterioration program and the applicable stack test results.

The two boilers are limited to a combined operation limit of less than or equal to 15,200 hours per 12-month rolling period while burning natural gas if natural gas is the only fuel used during the 12-month rolling period. Each boiler is rated at 81 million Btus per hour which is equivalent to combusting 1,231 million cubic feet of natural gas per 12-month rolling period if you assume natural gas has a heat input of 1,000 Btus per cubic foot. The hazardous air pollutant emission factors for firing these units with natural gas are from AP-42, Table 1.4-3, July 1998 and is 1.9 pounds per million cubic feet.

Using Equation 4-1, the 1.9 pounds per million cubic feet emission factors and operating limit were used to determine the potential hazardous air pollutant emissions from the two boilers (see Table 6-2 for results).

Table 6-2 -Potential Controlled Emissions for Hazardous Air Pollutants

Unit	Description	<b>Potential Emissions</b>
#4	Fermentation #1	0.5 tons per year <sup>1</sup>
#6	Regenerative thermal oxidizer	2.2 tons per year <sup>2</sup>
#10/#11	Boiler #1 and #2	1.2 tons per year
#26	Fermentation #2	0.6 tons per year <sup>1</sup>
#29	Cooler	0.7 tons per year
#15-#19	Tank #1 through #5	1.4 tons per year <sup>3</sup>
	Total	7 tons per year

<sup>&</sup>lt;sup>1</sup> – The potential emissions from Unit #4 and #26 based on the operational limit of only being used up to 500 hours per 12-month rolling period;

DENR reviewed the Maximum Achievable Control Technology Standards and determined the following may be applicable to Northern Lights Ethanol as an area source of hazardous air pollutants.

## **6.2** Industrial Process Cooling Towers

The national emission standard for industrial process cooling towers in 40 CFR Part 63, Subpart Q prohibits the use of chromium based water treatment chemicals in industrial process cooling towers. Northern Lights Ethanol uses two cooling towers in its operation. Since the compliance date for existing sources has passed, this rule does not apply provided no chromium based water

<sup>&</sup>lt;sup>2</sup> – The potential emissions based on Unit #4 and #26 bypassing for a combined 1,000 hours and the remaining 7,760 hours with both units exhausting through the regenerative thermal oxidizer; and

<sup>&</sup>lt;sup>3</sup> – Assumed worst case scenario. All volatile organic compound emissions were hazardous air pollutants.

treatment chemicals are used. If they are used, the source is in violation of this federal requirement.

In accordance with ARSD 74:36:05:04.01(8), a unit cannot be considered insignificant if a state or federal limit is applicable to the unit. The prohibition of chromium based water treatment chemicals is a limit. Therefore, the industrial process cooling tower cannot be considered insignificant activities and will be included in the permit.

#### **6.3** Chemical Processing Plants

On November 10, 2003, EPA finalized the maximum achievable control technology standard under 40 CFR Part 63, Subpart FFFF. This rule applies to the following chemical processing plants:

- 1. Those facilities that produce chemicals classified using the 1987 Standard Industrial Classification Manual of a code indicated by 282, 283, 284, 285, 286, 287, 289, or 386; and
- 2. Those facilities that are a major source of hazardous air pollutants. A major source of hazardous air pollutants has the potential to emit 10 tons of a single hazardous air pollutant and/or 25 tons of all hazardous air pollutants;

Northern Lights Ethanol's Standard Industrial Classification code is 2869, which falls underneath the code of 286. Northern Lights Ethanol requested operational restrictions that maintain hazardous air pollutant emissions less than the major source threshold under the Title V air quality operating permit program. Taking this into account, Northern Lights Ethanol is not applicable to this maximum achievable control technology standard.

#### 6.4 Industrial, Commercial, and Institutional Boilers and Process Heaters

40 CFR Part 63, Subpart DDDDD establishes national emission and operating limits for hazardous air pollutants emitted from industrial, commercial, and institutional boilers and process heaters located at a major source of hazardous air pollutant emissions. Because of emission and operational limits, Northern Lights Ethanol is considered an area source of hazardous air pollutants and not subject to this subpart.

#### 6.5 Area Source for Industrial, Commercial and Institutional Boilers

On March 21, 2011, EPA finalized the MACT standard under 40 CFR Part 63, Subpart JJJJJJ. This rule applies to all new or existing industrial, commercial, and institutional boilers located at an area source of hazardous air pollutants. An existing boiler is defined as a boiler where construction or reconstruction occurred prior to June 4, 2010.

Northern Lights Ethanol operates two boilers that were both constructed prior to June 4, 2010. Both boilers are rated at 81 million Btus per hour and are fired with natural gas and diesel. The

potential hazardous air pollutant emissions from Northern Lights Ethanol classify it as an area source of hazardous air pollutants.

Northern Lights Ethanol is subject to this subpart because it burns diesel in the two boilers.

#### 6.6 Other MACT Standards

DENR reviewed the other Maximum Achievable Control Technology Standards and determined there are no other standards applicable to this ethanol plant.

## **7.0** State Requirements

#### 7.1 State Particulate Emission Limits

ARSD 74:36:06:02(1) and 74:36:06:03(1), establish state emission limits for total suspended particulate matter. In addition, ARSD 74:36:12:01 establishes a visible emission limit of 20 percent opacity for each unit.

In accordance with ARSD 74:36:06:01, a unit that must comply with a total suspended particulate matter emission limit under the New Source Performance Standards, Maximum Achievable Control Technology Standards, the Acid Rain Program, or the Prevention of Significant Deterioration Program is exempt from having to meet the state's total suspended particulate matter emission limits. In this case, the two boilers are applicable to a New Source Performance Standard but are not required to meet a particulate matter limit.

In accordance with ARSD 74:36:06:02(1)(a), a fuel burning unit with heat input value less than 10 million Btus per hour may not exceed 0.6 pounds of particulate emissions per million Btu of heat input. Based on the heat input capacities of the permitted units, there are no units applicable to this total suspended particulate matter emission limit.

In accordance with ARSD 74:36:06:02(1)(b), a fuel burning unit with a heat input equal to or greater than 10 million Btus per hour heat input may not exceed the particulate emissions rate determined by Equation 7-1.

# Equation 7-1 – Particulate Emissions Limit for Fuel Burning Units = $E_{TSP} = 0.811 \times H^{-0.131}$

Where:

- $E_{TSP}$  = emission rate, in pounds per million Btu heat input, and
- H = heat input, in million Btus per hour.

Unit #6, #10, and #11 each have a heat input capacity greater than 10 million Btus per hour. Table 7-1 provides a maximum heat input value for each unit and the corresponding particulate

emission limit. Table 7-4 provides a comparison of the state emission limit to the potential emissions to determine if the units are in compliance with the state emission limits.

Table 7-1 -Total Suspended Particulate Matter Emission Limit for Fuel Burning Units

Unit	Description	Maximum Heat Input	State Emission Limit
#6	Dryers	115 million Btus per hour <sup>1</sup>	0.4 pounds per million Btus
#10	Boiler #1	81 million Btus per hour	0.5 pounds per million Btus
#11	Boiler #2	81 million Btus per hour	0.5 pounds per million Btus

<sup>&</sup>lt;sup>1</sup> – The maximum heat input value of 115 million Btus per hour is based on the maximum heat input for the two dryers in series (e.g., 55 million Btus per hour) and the third dryer (e.g., 60 million Buts per hour).

The particulate emission limits for process units are derived from ARSD 74:36:06:03(1). Equation 7-2, taken from ARSD 74:36:06:03(1)(a), is used to calculate the state limit of particulate emissions for each process unit with operating rates less than or equal to 30 tons per hour. This state limit is applicable to Unit #6, #7, #8, #22 through #25, and #27 through #30. Table 7-2 provides a maximum process rate for each unit and the corresponding particulate emission limit. Table 7-4 provides a comparison of the state emission limit to the potential emissions to determine if the units are in compliance with the state emission limits.

# Equation 7-2 – State Particulate Emission Limit for Process Units $\leq$ 30 tons per hour $E_{TSP} = 4.10 \times P^{0.67}$ Where:

- $E_{TSP}$  = Emission limit for total suspended particulate matter, in pounds per hour; and
- P = Design process rate, in tons per hour.

Table 7-2 -Total Suspended Particulate Matter Emission Limit for Processes

10000	Tuble 7-2 - Total Suspended I difficultie Matter Emission Limit for Trocesses				
Unit	<b>Maximum Process Rate</b>	State Emission Limit			
#6	30 tons per hour	40.0 pounds per hour	1.5 pounds per ton		
#7	30 tons per hour	40.0 pounds per hour	1.3 pounds per ton		
#8	30 tons per hour	40.0 pounds per hour	1.3 pounds per ton		
#22	24 tons per hour	34.5 pounds per hour	1.4 pounds per ton		
#23	24 tons per hour	34.5 pounds per hour	1.4 pounds per ton		
#24	24 tons per hour	34.5 pounds per hour	1.4 pounds per ton		
#25	24 tons per hour	34.5 pounds per hour	1.4 pounds per ton		
#27	24 tons per hour	34.5 pounds per hour	1.4 pounds per ton		
#28	24 tons per hour	34.5 pounds per hour	1.4 pounds per ton		
#29	30 tons per hour	40.0 pounds per hour	1.3 pounds per ton		
#30	30 tons per hour	40.0 pounds per hour	1.3 pounds per ton		

Equation 7-3, taken from ARSD 74:36:06:03(1)(b), is used to calculate the state limit of particulate emissions for each process unit with operating rates greater than 30 tons per hour. This state limit is applicable to Unit #1, #2, and #3. Table 7-3 provides a maximum process rate for each unit and the corresponding particulate emission limit. Table 7-4 provides a comparison

of the state emission limit to the potential emissions to determine if the units are in compliance with the state emission limits.

# Equation 7-3 – State Particulate Emission Limit for Process Units $\leq$ 30 tons per hour $E_{TSP} = (55.0 \times P^{0.11}) - 40$ Where:

- $E_{TSP}$  = Emission limit for total suspended particulate matter, in pounds per hour; and
- P = Design process rate, in tons per hour.

Table 7-3 –Total Suspended Particulate Matter Emission Limit for Processes

Unit	<b>Maximum Process Rate</b>	State Emission Limit	
#1	840 tons per hour	75.4 pounds per hour	0.1 pounds per ton
#2	140 tons per hour	54.7 pounds per hour	0.4 pounds per ton

Table 7-4 – State Total Suspended Particulate Matter Limit Compared to Stack Test Results

Unit	State Emission Limit	<b>Stack Test Results</b>	In Compliance
#1	75.4 pounds per hour	0.08 pounds per hour	Yes
#2	54.7 pounds per hour	0.01 pounds per hour	Yes
#6	32.5 pounds per hour	2.8 pounds per hour	Yes
#7	40.0 pounds per hour	0.39 pounds per hour	Yes
#8	40.0 pounds per hour	0.01 pounds per hour	Yes
#10	40.5 pounds per hour <sup>1</sup>	0.42 pounds per hour	Yes
#11	40.5 pounds per hour <sup>1</sup>		
#22	34.5 pounds per hour		
#23	34.5 pounds per hour	0.05 pounds per hour	Yes
#24	34.5 pounds per hour	0.03 pounds per hour	Yes
#25	34.5 pounds per hour		
#27	34.5 pounds per hour		
#28	34.5 pounds per hour		
#29	40.0 pounds per hour	0.32 pounds per hour	Yes
#30	40.0 pounds per hour		

<sup>&</sup>lt;sup>1</sup> – The pounds per hour emission limit is based on the maximum heat input of 81 million Btus per hour multiplied by the emission limit in pounds per million Btus.

Based on the stack test results for the two hammer mills, it is reasonable to assume the other hammer mills (e.g., Unit #22, #25, #27, and #28) are in compliance with the state's particulate matter emission limit. The same can be assumed for Boiler #2 based on the stack test results for Boiler #1.

#### 7.2 State Sulfur Dioxide Emission Limits

In accordance with ARSD 74:36:06:02(2) and ARSD 74:36:06:03(2), the permitted units may not emit sulfur dioxide emissions to the ambient air in an amount greater than three pounds of

sulfur dioxide per million Btus of heat input. The sulfur dioxide emission limit is applicable to Unit #6, #10, and #11.

In accordance with ARSD 74:36:06:01, a unit that must comply with a sulfur dioxide emission limit under the New Source Performance Standards, Maximum Achievable Control Technology Standards, the Acid Rain Program, or the Prevention of Significant Deterioration Program is exempt from having to meet the state's sulfur dioxide emission limit. In this case, the two boilers are subject to a New Source Performance Standard and required to meet a sulfur dioxide emission limit through limitations on the amount of sulfur present in the diesel. Therefore, the two boilers are no subject to the state's sulfur dioxide limit while burning diesel.

The two boilers are fired with natural gas and diesel and the dryer system is fired with natural gas. The sulfur content of natural gas is less than 0.01 pounds per million Btus and capable of meeting the state's sulfur dioxide emission limit.

#### **7.3** Performance Tests

Northern Lights Ethanol conducted performance testing in 2007 to prove compliance with the currently permitted short-term limits. Table 7-6 summarizes the applicable test results.

Table 7-6 – Comparison of Short Term Limits and Stack Test Results

		Short Term	Stack Test	Percentage of
Unit	Pollutant	(pounds/hour)	(pounds/hour)	<b>Short Term Limit</b>
#1	PM	1.0 pounds per hour	0.08 pounds per hour	8%
#2	PM	0.1 pounds per hour	0.01 pounds per hour	10%
#4	VOC	10.1 pounds per hour	6.3 pounds per hour	62%
#6	PM	10.0 pounds per hour	2.8 pounds per hour	28%
	NOx	14.0 pounds per hour	11.4 pounds per hour	81%
	CO	15.0 pounds per hour	8.6 pounds per hour	57%
	VOC	10.0 pounds per hour	3.3 pounds per hour	33%
#7	PM	1.2 pounds per hour	0.4 pounds per hour	33%
#8	PM	0.1 pounds per hour	0.01 pounds per hour	10%
#10	PM <sup>1</sup>	0.3 pounds per hour	0.3 pounds per hour	100%
	PM <sup>2</sup>	0.8 pounds per hour	0.4 pounds per hour	50%
	NOx <sup>2</sup>	8.9 pounds per hour	7.8 pounds per hour	88%
	CO <sup>2</sup>	6.5 pounds per hour	4.5 pounds per hour	69%
	VOC 1	0.3 pounds per hour	0.1 pounds per hour	33%
	VOC <sup>2</sup>	0.8 pounds per hour	0.2 pounds per hour	25%
#11	NOx <sup>1</sup>	3.6 pounds per hour	2.7 pounds per hour	75%
	CO <sup>1</sup>	3.2 pounds per hour	0.03 pounds per hour	1%
#23	PM	0.5 pounds per hour	0.05 pounds per hour	1%
#24	PM	0.5 pounds per hour	0.03 pounds per hour	6%
#26	VOC	15.2 pounds per hour	13.3 pounds per hour	88%
#29	PM	1.5 pounds per hour	0.3 pounds per hour	20%

		Short Term	Stack Test	Percentage of
Unit	Pollutant	(pounds/hour)	(pounds/hour)	Short Term Limit
	VOC	7.0 pounds per hour	3.0 pounds per hour	43%

<sup>&</sup>lt;sup>1</sup> – The boiler was fired with natural gas; and

Northern Lights Ethanol requested the methodology to determine compliance with volatile organic compound (VOC) emission limits be based on POET's consent decree with EPA Region 8 regarding another POET biorefinery located in South Dakota. EPA required POET to request a permit modification at its facilities to clarify the required test methodology when determining compliance with applicable volatile organic compound emission limits. POET is requesting the following permit language be included in the permit renewal regarding stack testing requirements:

- 1. <u>Required Test Methods.</u> The owner or operator shall conduct all volatile organic compound mass emission performance tests in accordance with 40 CFR Part 51, Appendix M, Method 207 and 40 CFR Part 60, Appendix A, Method 18;
- 2. <u>Treatment of 2,3-Butanediol.</u> Due to difficulties associated with appropriate method detection limit, 2,3-Butanediol will be sampled through the chromatography column approximately 2.5 times faster than the maximum allowable sampling rate for the other volatile organic compound in the sampling program (e.g. acetaldehyde, acrolein, and ethyl acetate). This requirement applies only if the Method 207 results indicate that 2,3-Butanediol should be sampled as part of the Method 18 testing;
- 3. <u>Treatment of Non-Detects.</u> When summing analytes per Method 18, non-detect data will be included in the total volatile organic compound mass as one half of the compound method detection limit; except that, if all three performance test runs result in a non-detect measurement and the method detection limit is less than or equal to 1.0 part per million by volume on a dry basis, then all such non-detect data will be treated as zero.

The new testing methodology was used during the February 2011 stack testing which determined the VOC and hazardous air pollutant emission rates for Unit #4, #5, #26, and #29. Based on the stack testing dates and the results compared to the short term limits, DENR will require the following testing requirements as part of the proposed renewal:

- 1. Particulate matter testing on Unit #10 (e.g., while burning natural gas);
- 2. Carbon monoxide testing on #10 (e.g., while burning diesel); and
- 3. Nitrogen oxide testing on Unit #6 and #10 (e.g., while burning diesel).

### 7.4 Compliance Assurance Monitoring

Compliance assurance monitoring is applicable to any unit at major sources applying for a Title V air quality operating permit that meets the following criteria:

1. The unit is subject to an emission limit or standard for the applicable regulated air pollutant;

<sup>&</sup>lt;sup>2</sup> – The boiler was fired with diesel.

- 2. The unit uses a control device to achieve compliance with any such emission limit or standard; and
- 3. The unit has potential uncontrolled emissions of the applicable regulated air pollutant that are equal to or greater than 100 percent of the amount, in tons per year, required for a source to be classified as a major source.

Northern Lights Ethanol is applying for a Title V air quality operating permit and is a major source under the Title V air quality operating permit program for greenhouse gases. The following units meet all three criteria for compliance assurance monitoring:

- 1. Unit #4 for volatile organic compounds;
- 2. Unit #6 for volatile organic compounds; and
- 3. Unit #26 for volatile organic compounds.

Compliance assurance monitoring for Unit #4 and #26 will consist of establishing water flow rate limits during stack performance test. Northern Lights Ethanol installed and maintains a device that continuously records the water flow rate for the wet scrubber associated with both units. Northern Lights Ethanol will be required to maintain the water flow rate at or greater than the average water flow rate achieved during the most recent performance test that demonstrated compliance with the appropriate permit limit.

Compliance assurance monitoring for Unit #6 will consist of establishing temperature limits during stack performance tests. Northern Lights Ethanol installed and maintains a device that continuously records the temperature of the exhaust gases exiting the stack of Unit #6. Northern Lights Ethanol will be required to maintain the temperature of the exhaust gases at or greater than the average temperature achieved during the most recent performance test that demonstrated compliance with the appropriate permit limit.

#### 7.5 Periodic Monitoring

Periodic monitoring is required for each emission unit that is subject to an applicable requirement at a source subject to the Title V air quality operating permit program. The permitted units at this facility are required to meet opacity, particulate matter, sulfur dioxide, nitrogen oxide, carbon monoxide, operational limits, and limits applicable to the New Source Performance Standards and Maximum Achievable Control Technology Standards. Periodic monitoring will be based on the following:

- 1. Periodic monitoring for opacity will be based on periodic visible emission readings or evaluations. Periodic monitoring of particulate matter emissions will consist of visible emission readings and proper operation and maintenance of all pollution control devices.
- 2. Periodic monitoring of sulfur dioxide emissions for units burning natural gas is not required based on the sulfur content in pipeline quality natural gas.
- 3. Periodic monitoring of the nitrogen oxide emission limit for Unit #10 and #11 will be based on good combustion practices. Periodic monitoring for the thermal oxidizer will be based on monitoring the temperature to ensure good combustion.

- 4. Periodic monitoring of the carbon monoxide emission limits will be based on good combustion practices.
- 5. Periodic monitoring of volatile organic compound emission limits will be based on recordkeeping, reporting, and leak checks in accordance with the New Source Performance Standards. Periodic monitoring for Unit #4 and #26 will be based on monitoring the water flow rate. Periodic monitoring for Unit #6 will be based on monitoring the temperature of the exhaust gases.

Periodic monitoring of the operational limit shall be based on recordkeeping and reporting requirements. The applicable limits in the New Source Performance Standards and Maximum Achievable Control Technology Standards will be based on the requirements in the applicable standard.

The flare associated with Unit #20 is used to reduce volatile organic compound emissions. Even though the flare does not have a specific volatile organic compound limit, to verify the flare is operating properly, the requirements in 40 CFR 60.18 will be used as periodic monitoring for its operation.

#### 7.6 Air Fees

Sources subject to the Title V air quality operating permit program are subject to an annual air quality fee. The fee consists of an administrative fee and a per ton fee based on the actual tons per year of pollutant emitted. The pollutants charged for are particulate matter, sulfur dioxides, nitrogen oxides, volatile organic compounds, and hazardous air pollutants. The actual emissions are calculated by DENR based on operational information provided by the source.

#### 8.0 Recommendation

Any source operating in South Dakota that meets the definition of a major source for any criteria pollutant is required to obtain a Title V air quality operating permit. A major source is defined as having the potential to emit greater than 100 tons per year of a criteria pollutant or greater than or equal to 10 tons per year of a single hazardous air pollutant, or greater than or equal to 25 tons per year of a combination of hazardous air pollutants. In addition, sources subject to federal New Source Performance Standards or national emission standards for hazardous air pollutants must obtain a Title V air quality operating permit, unless otherwise noted in the state or federal rule.

Northern Lights Ethanol accepted enforceable permit conditions to maintain its potential air emissions below the major source threshold under the Prevention of Significant Deterioration air quality preconstruction permit program. These enforceable permit conditions also maintain potential emissions below the major source threshold under the Title V air quality operating permit program. However, Northern Lights Ethanol is subject to several New Source Performance Standards and Maximum Achievable Control Technology Standards and is

considered a major source for greenhouse gases. Therefore, Northern Lights Ethanol is required to obtain a Title V air quality operating permit.

Based on the above findings, Northern Lights Ethanol is required to operate within the requirements stipulated in the following regulations:

- 1. ARSD 74:36:05 Operating Permits for Part 70 Sources;
- 2. ARSD 74:36:06 Regulated Air Pollutant Emissions;
- 3. ARSD 74:36:07 New Source Performance Standards;
- 4. ARSD 74:36:08 National Emission Standards for Hazardous Air Pollutants;
- 5. ARSD 74:36:11 Stack Performance Testing; and
- 6. ARSD 74:36:12 Control of Visible Emissions.

Based on the information submitted in the air quality permit application, DENR recommends conditional approval to renew Northern Lights Ethanol's Title V air quality operating permit. Any questions pertaining to this permit recommendation should be directed to Marc Macy, Engineer III, at (605) 773 3151.